

# SEQUENCE LISTING

<110> CALLEN, Walter

<120> XYLOSE ISOMERASES, NUCLEIC ACIDS ENCODING THEM AND METHODS  
FOR MAKING AND USING THEM

<130> 564462005501

<140> US 10/533,241

<141> 2003-10-23

<150> PCT/US03/34008

<151> 2003-10-23

<150> US 60/424,649

<151> 2002-11-06

<160> 4

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 1335

<212> DNA

<213> unknown

<220>

<223> obtained from an environmental sample

<400> 1

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| atgactgagt  | tctttccaga | gatcccgaa   | atacagtttg  | aaggtaaaga  | gagcacaat   | 60   |
| ccatttgctg  | tcaagttcta | cgatccaaac  | gaggtgatcg  | acggaaaacc  | tctcaaggac  | 120  |
| catctgaagt  | tctcagttgc | attctggcac  | accttcgtga  | acgaggggag  | agatcccttc  | 180  |
| ggagatccaa  | cagccgaccg | accctggaac  | aagtacacag  | accctatgga  | caaagccttt  | 240  |
| gcaaggggtg  | acgccctctt | tgaattctgt  | gaaaaactca  | acatcgagta  | cttctgtttt  | 300  |
| cacgacaggg  | acatagctcc | tgaaggaaag  | actctgaggg  | agacaaacaa  | gatcctggac  | 360  |
| aaggtcgtgg  | agaggatcaa | agagagaatg  | aaagacagca  | acgtaaaact  | cctctggggg  | 420  |
| actgccaatc  | tcttttctca | tccaaggtac  | atgcacggtg  | cggcgacaac  | ctgtagtgt   | 480  |
| gatgtcttcg  | cctacgcggc | agcacagggt  | aagaaagccc  | ttgagatcac  | aaaagagctt  | 540  |
| ggaggagaag  | ggtacgtctt | ttgggggtgga | agagaagggg  | acgagacact  | cctcaacacg  | 600  |
| gatctggatc  | ttgaacttgg | aaacctcgct  | cgcttctctca | gaatggctgt  | ggattacgca  | 660  |
| aagaagatag  | gtttcaacgg | ccagtttctc  | atcgagccta  | aaccgaagga  | accaacgaag  | 720  |
| catcagtacg  | acttcgatgt | tgcgacggct  | tacgccttcc  | tgaagagtca  | cggctctcgat | 780  |
| gagtatttca  | aattcaacat | cgaagcgaac  | catgccacac  | ttgctgggtca | caccttccag  | 840  |
| cacgaactga  | ggatggcaag | aattcttgga  | aaactcggca  | gcatcgacgc  | gaaccagggg  | 900  |
| gaccttctgc  | tcggctggga | caccgaccag  | ttcccaacaa  | acgtctacga  | cacaactctt  | 960  |
| gccatgtatg  | aagtataaaa | agcgggtggg  | tttacaaaag  | gtgggtctcaa | cttcgatgca  | 1020 |
| aagggtgagaa | gagcttctta | caagggtgga  | gatctcttca  | tcgggcacat  | agcaggaatg  | 1080 |
| gatactttcg  | cactcgggtt | caaaatagcc  | cacaaacttg  | taaaagacgg  | tgtgttcgac  | 1140 |
| aagttcattg  | aagaaaaata | caaaagtctc  | agagagggca  | tcggaaaaga  | gatcggtgaa  | 1200 |
| ggaaaggcag  | attttgaaaa | gctggaagct  | tatataatag  | acaaggaaga  | gatggagctt  | 1260 |
| ccatctggaa  | agcaggagta | tttggaaggt  | ctcctcaaca  | gctacatagt  | gaaaacgatc  | 1320 |
| tccgagttga  | ggtga      |             |             |             |             | 1335 |

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<212> PRT

<213> unknown

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<223> obtained from an environmental sample

<400> 2

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Thr | Glu | Phe | Phe | Pro | Glu | Ile | Pro | Lys | Ile | Gln | Phe | Glu | Gly | Lys |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Glu | Ser | Thr | Asn | Pro | Phe | Ala | Phe | Lys | Phe | Tyr | Asp | Pro | Asn | Glu | Val |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Ile | Asp | Gly | Lys | Pro | Leu | Lys | Asp | His | Leu | Lys | Phe | Ser | Val | Ala | Phe |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Trp | His | Thr | Phe | Val | Asn | Glu | Gly | Arg | Asp | Pro | Phe | Gly | Asp | Pro | Thr |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Ala | Asp | Arg | Pro | Trp | Asn | Lys | Tyr | Thr | Asp | Pro | Met | Asp | Lys | Ala | Phe |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Ala | Arg | Val | Asp | Ala | Leu | Phe | Glu | Phe | Cys | Glu | Lys | Leu | Asn | Ile | Glu |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Tyr | Phe | Cys | Phe | His | Asp | Arg | Asp | Ile | Ala | Pro | Glu | Gly | Lys | Thr | Leu |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Arg | Glu | Thr | Asn | Lys | Ile | Leu | Asp | Lys | Val | Val | Glu | Arg | Ile | Lys | Glu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Arg | Met | Lys | Asp | Ser | Asn | Val | Lys | Leu | Leu | Trp | Gly | Thr | Ala | Asn | Leu |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Phe | Ser | His | Pro | Arg | Tyr | Met | His | Gly | Ala | Ala | Thr | Thr | Cys | Ser | Ala |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Asp | Val | Phe | Ala | Tyr | Ala | Ala | Ala | Gln | Val | Lys | Lys | Ala | Leu | Glu | Ile |
|     |     |     |     | 165 |     |     |     | 170 |     |     |     |     |     | 175 |     |
| Thr | Lys | Glu | Leu | Gly | Gly | Glu | Gly | Tyr | Val | Phe | Trp | Gly | Gly | Arg | Glu |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Gly | Tyr | Glu | Thr | Leu | Leu | Asn | Thr | Asp | Leu | Asp | Leu | Glu | Leu | Gly | Asn |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Leu | Ala | Arg | Phe | Leu | Arg | Met | Ala | Val | Asp | Tyr | Ala | Lys | Lys | Ile | Gly |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Phe | Asn | Gly | Gln | Phe | Leu | Ile | Glu | Pro | Lys | Pro | Lys | Glu | Pro | Thr | Lys |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| His | Gln | Tyr | Asp | Phe | Asp | Val | Ala | Thr | Ala | Tyr | Ala | Phe | Leu | Lys | Ser |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| His | Gly | Leu | Asp | Glu | Tyr | Phe | Lys | Phe | Asn | Ile | Glu | Ala | Asn | His | Ala |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Thr | Leu | Ala | Gly | His | Thr | Phe | Gln | His | Glu | Leu | Arg | Met | Ala | Arg | Ile |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Leu | Gly | Lys | Leu | Gly | Ser | Ile | Asp | Ala | Asn | Gln | Gly | Asp | Leu | Leu | Leu |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Gly | Trp | Asp | Thr | Asp | Gln | Phe | Pro | Thr | Asn | Val | Tyr | Asp | Thr | Thr | Leu |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Ala | Met | Tyr | Glu | Val | Ile | Lys | Ala | Gly | Gly | Phe | Thr | Lys | Gly | Gly | Leu |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Asn | Phe | Asp | Ala | Lys | Val | Arg | Arg | Ala | Ser | Tyr | Lys | Val | Glu | Asp | Leu |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Phe | Ile | Gly | His | Ile | Ala | Gly | Met | Asp | Thr | Phe | Ala | Leu | Gly | Phe | Lys |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Ile | Ala | His | Lys | Leu | Val | Lys | Asp | Gly | Val | Phe | Asp | Lys | Phe | Ile | Glu |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Glu | Lys | Tyr | Lys | Ser | Phe | Arg | Glu | Gly | Ile | Gly | Lys | Glu | Ile | Val | Glu |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Gly | Lys | Ala | Asp | Phe | Glu | Lys | Leu | Glu | Ala | Tyr | Ile | Ile | Asp | Lys | Glu |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Glu | Met | Glu | Leu | Pro | Ser | Gly | Lys | Gln | Glu | Tyr | Leu | Glu | Ser | Leu | Leu |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Asn | Ser | Tyr | Ile | Val | Lys | Thr | Ile | Ser | Glu | Leu | Arg |     |     |     |     |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     |     |     |     |     |

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 <213> unknown

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<400> 3

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| cctcttgcc   | tttaagttcta | cgatccagac  | gaagtaatcg | atggaaaacc  | tctgaaggac | 120  |
| catttgaaat  | tctccggtgc  | tttctggcac  | acttttgtaa | acgaaggtcg  | agatcccttc | 180  |
| ggtgacccca  | ctgctgaaaag | accctggaac  | aagtattcgg | atcccatgga  | caaagcggtt | 240  |
| gcaagagtgg  | atgctttatt  | cgaattctgt  | gagaaactca | atattgaata  | cttttgtttt | 300  |
| catgacagag  | acattgcacc  | cgaagggaaa  | actctgagag | agacgaacaa  | aattctggac | 360  |
| aaagtgtgtg  | agaaaataaa  | agaacgaatg  | aaggaaagca | atgtgaaact  | cctttgggga | 420  |
| actgccaatc  | tgttctcaca  | tcctcggtac  | atgcacggtg | cggcaactac  | ttgcagcgcc | 480  |
| gatgtttttg  | catacgtctg  | tgacacaggtg | aaaaaagcgt | tgagagattac | gaaggaactt | 540  |
| ggaggagaag  | gatatgtttt  | ttggggcggt  | agagaaggat | acgaaacctt  | gctcaacacg | 600  |
| gatttgggat  | tggaactcga  | aaacctcgcg  | aggttcctca | gaatggccgt  | agagtacgca | 660  |
| aagaagatag  | gttttgatgg  | acagttcctc  | atagaacca  | aaccaaaga   | accacaaaa  | 720  |
| catcagtacg  | atttcgacgt  | agcgaccgca  | tacgccttct | tgaaaactca  | cgatttggat | 780  |
| gaataacttca | agttcaacat  | agaagcta    | cacgcaacac | tcgctggtca  | tactttccag | 840  |
| catgaattga  | gaatggccag  | aatcctcgga  | aaattcgga  | gtatcgacgc  | aatcaaggc  | 900  |
| gatcttctgt  | tgggatggga  | caccgatcaa  | tttccaacga | acgtatacga  | tacaactctt | 960  |
| gccatgtacg  | aggttataaa  | agcagggggt  | ttcacaaaag | gtggtctcaa  | cttcgacgcc | 1020 |
| aaagtgagac  | gtgcttctta  | caaggtagag  | gatctcttca | tcgggcatat  | agtaggaata | 1080 |
| gacactttcg  | cactcggttt  | caagatagcc  | tacaaacttg | taaaagacgg  | cgtattcgac | 1140 |
| agattcggtg  | aggaaaaata  | cagaagtttc  | agagaaggta | ttggaaaaga  | aatattggaa | 1200 |
| ggaaaagcag  | attttgaaaa  | actagaatcg  | tatataatag | acaaagaaga  | tggtgaactt | 1260 |
| ccatctggaa  | aacaggagta  | tcttgaaagt  | ttgctcaaca | gctatatcgt  | gaagaccgta | 1320 |
| tcagaactga  | ggtga       |             |            |             |            | 1335 |

<210> 4

<211> 444

<212> PRT

<213> unknown

<220>

<223> obtained from an environmental sample

<400> 4

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Thr | Glu | Phe | Phe | Pro | Glu | Ile | Pro | Lys | Ile | Gln | Phe | Glu | Gly | Lys |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Glu | Ser | Asn | Asn | Pro | Leu | Ala | Phe | Lys | Phe | Tyr | Asp | Pro | Asp | Glu | Val |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Ile | Asp | Gly | Lys | Pro | Leu | Lys | Asp | His | Leu | Lys | Phe | Ser | Val | Ala | Phe |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Trp | His | Thr | Phe | Val | Asn | Glu | Gly | Arg | Asp | Pro | Phe | Gly | Asp | Pro | Thr |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Ala | Glu | Arg | Pro | Trp | Asn | Lys | Tyr | Ser | Asp | Pro | Met | Asp | Lys | Ala | Phe |
| 65  |     |     |     |     | 70  |     |     |     | 75  |     |     |     |     | 80  |     |
| Ala | Arg | Val | Asp | Ala | Leu | Phe | Glu | Phe | Cys | Glu | Lys | Leu | Asn | Ile | Glu |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Tyr | Phe | Cys | Phe | His | Asp | Arg | Asp | Ile | Ala | Pro | Glu | Gly | Lys | Thr | Leu |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Arg | Glu | Thr | Asn | Lys | Ile | Leu | Asp | Lys | Val | Val | Glu | Lys | Ile | Lys | Glu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     |     | 125 |     |     |
| Arg | Met | Lys | Glu | Ser | Asn | Val | Lys | Leu | Leu | Trp | Gly | Thr | Ala | Asn | Leu |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Phe | Ser | His | Pro | Arg | Tyr | Met | His | Gly | Ala | Ala | Thr | Thr | Cys | Ser | Ala |
| 145 |     |     |     |     | 150 |     |     |     | 155 |     |     |     |     | 160 |     |
| Asp | Val | Phe | Ala | Tyr | Ala | Ala | Ala | Gln | Val | Lys | Lys | Ala | Leu | Glu | Ile |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Thr | Lys | Glu | Leu | Gly | Gly | Glu | Gly | Tyr | Val | Phe | Trp | Gly | Gly | Arg | Glu |
|     |     |     | 180 |     |     |     | 185 |     |     |     |     |     | 190 |     |     |
| Gly | Tyr | Glu | Thr | Leu | Leu | Asn | Thr | Asp | Leu | Gly | Leu | Glu | Leu | Glu | Asn |
|     |     | 195 |     |     |     | 200 |     |     |     |     |     | 205 |     |     |     |
| Leu | Ala | Arg | Phe | Leu | Arg | Met | Ala | Val | Glu | Tyr | Ala | Lys | Lys | Ile | Gly |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Phe | Asp | Gly | Gln | Phe | Leu | Ile | Glu | Pro | Lys | Pro | Lys | Glu | Pro | Thr | Lys |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| His | Gln | Tyr | Asp | Phe | Asp | Val | Ala | Thr | Ala | Tyr | Ala | Phe | Leu | Lys | Thr |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     |     | 255 |
| His | Asp | Leu | Asp | Glu | Tyr | Phe | Lys | Phe | Asn | Ile | Glu | Ala | Asn | His | Ala |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Thr | Leu | Ala | Gly | His | Thr | Phe | Gln | His | Glu | Leu | Arg | Met | Ala | Arg | Ile |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Leu | Gly | Lys | Phe | Gly | Ser | Ile | Asp | Ala | Asn | Gln | Gly | Asp | Leu | Leu | Leu |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Gly | Trp | Asp | Thr | Asp | Gln | Phe | Pro | Thr | Asn | Val | Tyr | Asp | Thr | Thr | Leu |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Ala | Met | Tyr | Glu | Val | Ile | Lys | Ala | Gly | Gly | Phe | Thr | Lys | Gly | Gly | Leu |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     |     | 335 |
| Asn | Phe | Asp | Ala | Lys | Val | Arg | Arg | Ala | Ser | Tyr | Lys | Val | Glu | Asp | Leu |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Phe | Ile | Gly | His | Ile | Val | Gly | Ile | Asp | Thr | Phe | Ala | Leu | Gly | Phe | Lys |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Ile | Ala | Tyr | Lys | Leu | Val | Lys | Asp | Gly | Val | Phe | Asp | Arg | Phe | Val | Glu |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Glu | Lys | Tyr | Arg | Ser | Phe | Arg | Glu | Gly | Ile | Gly | Lys | Glu | Ile | Leu | Glu |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Gly | Lys | Ala | Asp | Phe | Glu | Lys | Leu | Glu | Ser | Tyr | Ile | Ile | Asp | Lys | Glu |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Asp | Val | Glu | Leu | Pro | Ser | Gly | Lys | Gln | Glu | Tyr | Leu | Glu | Ser | Leu | Leu |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Asn | Ser | Tyr | Ile | Val | Lys | Thr | Val | Ser | Glu | Leu | Arg |     |     |     |     |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     |     |     |     |     |